Chapter 10. Air Quality

Environmental Setting

The environmental setting first identifies the air quality criteria pollutants of concern in California and compares them to pollutants that are emitted during biosolids transport and application. Nuisance pollutants, including odors and wind-blown dust, are also described. This discussion explains California's climate and meteorology and their effect on air quality.

Pollutants of Concern

The GO applies to lands in each of California's 15 air basins (See Figure 10-1). Except for the Lake County Air Basin, each of the 15 air basins has violated either the state or federal ambient air quality standards shown in Table 10-1.

Of the pollutants for which ambient air quality standards have been developed, those emitted in the greatest quantities by biosolids transport and application include carbon monoxide (CO), inhalable particulates (PM10 and PM2.5), and the ozone precursors (oxides of nitrogen [NO_x] and reactive organic gases [ROG]).

These pollutants are emitted primarily as exhaust from trucks used to transport biosolids from wastewater treatment plants to land application sites and by biosolids spreaders.

Fugitive dust is also generated from trucks traveling on paved and unpaved roads and by biosolids spreaders operating at farm sites.

Attainment/Nonattainment Status

Table 10-2 shows the attainment versus nonattainment status for the 15 California air basins with regard to the pollutants of most concern from biosolids application. In 1998, 76% of all biosolids application within California occurred in the Central Valley (64% within the San Joaquin Valley Air Basin and 12% within the Sacramento Valley Air Basin). Only 5% of total statewide biosolids application occurred within the San Francisco Bay Area Air Basin. The southern California air basins (South Coast Air District, San Diego Air Basin, Mojave Desert Air Basin, and Salton Sea Air Basin) were

combined for 17.8% of statewide biosolids application. No other areas of California had more than 1% of total statewide biosolids application.

A comparison of the attainment/nonattainment status of the 15 air basins listed in Table 10-2 with the quantity of biosolids applied within California shows that each of the areas with substantial biosolids application are nonattainment for state and federal ozone standards. With the exception of the San Francisco Bay Area, those areas are also nonattainment for the state and federal PM10 standards. Consequently, the following analysis focuses on ozone and PM10. CO, which is also emitted in vehicle exhaust, is generally not a health concern in rural, agricultural areas where biosolids are typically applied.

Ozone

Ozone is a regional pollutant. It is not emitted directly into the air, but is formed by a photochemical reaction in the atmosphere. Ozone precursors, which include ROG and NO_x, react in the atmosphere in the presence of sunlight to form ozone. Both ROG and NO_x are emitted by motor vehicles. Because photochemical reaction rates depend on the intensity of ultraviolet light and air temperature, ozone is primarily a summer air-pollution problem and because photochemical reactions take time to occur, high ozone levels often occur downwind of the emission source. Ozone is a respiratory irritant that increases susceptibility to respiratory infections. Ozone is also an oxidant and can cause substantial damage to vegetation and other materials.

State and federal ozone standards have been set for 1-hour averaging times (see Table 10-1). In July 1997, the U.S. Environmental Protection Agency (EPA) also added an 8-hour averaging time for ozone.

Particulate Matter

Health concerns associated with suspended particulate matter focus on those particles small enough to reach the lungs when inhaled (i.e., 10 microns or less in diameter). Consequently, both the federal and state air quality standards for particulate matter apply only to particulate matter that fit this criteria (referred to as PM10).

State and federal PM10 standards have been established for 24-hour and annual averaging times (see Table 10-1). In July 1997, the EPA also added 24-hour and 8-hour standards for fine particulates defined as particulate matter 2.5 microns or less in diameter (PM2.5). Both PM10 and PM2.5 are present in motor vehicle exhaust and are released when dust is kicked up by moving vehicles.

Jones & Stokes Associates, Inc.

Figure 10-1
California Air Basins

Table 10-1.
Ambient Air Quality Standards Applicable in California

			Standard, as parts per million		Standard, as micrograms per cubic meter		Violation Criteria	
Pollutant	**Symbol**	**Average Time**	**California**	**National**	**California**	**National**	**California**	**National**
Ozone	O_3	8 hours	N/A	0.08	N/A	160	N/A	If 3-year average of annual third-highest daily 8-hour maximum exceeds standard
		1 hour	0.09	0.12	180	235	If exceeded	If exceeded on more than 3 days in 3 years
Carbon monoxide	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
		1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
(Lake Tahoe only)		8 hours	6	N/A	7,000	N/A	If exceeded	N/A
Nitrogen dioxide	NO_2	Annual average	N/A	0.053	N/A	100	N/A	If exceeded
		1 hour	0.25	N/A	470	N/A	If exceeded	N/A
Sulfur dioxide	SO_2	Annual average	N/A	0.03	N/A	80	N/A	If exceeded
		24 hours	0.04	0.14	105	365	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.25	N/A	655	N/A	N/A	N/A
Hydrogen sulfide	H_2S	1 hour	0.03	N/A	42	N/A	If equaled or exceeded	N/A
Vinyl chloride	C_2H_3Cl	24 hours	0.010	N/A	26	N/A	If equaled or exceeded	N/A
Inhalable particulate matter	PM10	Annual geometric mean	N/A	N/A	30	N/A	If exceeded	N/A
		Annual arithmetic mean	N/A	N/A	N/A	50	N/A	If exceeded
		24 hours	N/A	N/A	50	150	N/A	If exceeded on more than 1 day per year

Table 10-1. Continued

Pollutant	Symbol	Average Time	Standard, as parts per million		Standard, as micrograms per cubic meter		Violation Criteria	
			California	National	California	National	California	National
Fine particulate matter	PM2.5	Annual arithmetic mean	N/A	N/A	N/A	15	N/A	If spatial average exceeded on more than 3 days in 3 years
		24 hours	N/A	N/A	N/A	65	N/A	If exceeds 98th percentile of concentrations in a year
Sulfate particles	SO_4	24 hours	N/A	N/A	25	N/A	If equaled or exceeded	N/A
Lead particles	Pb	Calendar quarter	N/A	N/A	N/A	1.5	N/A	If exceeded no more than 1 day per year
		30 days	N/A	N/A	1.5	N/A	If equaled or exceeded	N/A

Notes: All standards are based on measurements at 25EC and 1 atmosphere pressure.
National standards shown are the primary (health effects) standards.
N/A = not applicable.

Table 10-2
Air Quality Requirement Attainment Status by Pollutant and Air Basin

Air Basin	State Ozone	Federal Ozone	State PM10	Federal PM10	State CO	Federal CO
North Coast Air Basin	A	A	N	A	A	A
San Francisco Bay Area Air Basin	N	N	N	A	A	A
North Central Coast Air Basin	T	A	N	A	A	A
South Central Coast Air Basin	N	N	N	A	A	A
South Coast Air Basin	N	N	N	N	N	N
San Diego Air Basin	N	N	N	A	A	A
Northeast Plateau Air Basin	A	A	N	A	A	A
Sacramento Valley Air Basin	N	N	N	N	A	A
San Joaquin Valley Air Basin	N	N	N	N	A	A
Great Basin Valleys Air Basin	T	A	N	N	A	A
Mojave Desert Air Basin	N	N	N	N	A	A
Salton Sea Air Basin	N	N	N	N	N	A
Mountain Counties Air Basin	N	N	N	A	A	A
Lake County Air Basin	A	A	A	A	A	A
Lake Tahoe Air Basin	A	A	N	A	A	A

Notes: A = Attainment
N = Nonattainment
T = Transitional

Air basins classified as nonattainment areas have at least one area within that basin that has shown a violation of the relevant ambient standard.

Source: California Air Resources Board 1998.

Nuisance Pollutants

Nuisance pollutants that could potentially be released by implementation of the proposed project include odors and visible dust. These pollutants are regulated by nuisance rules incorporated into air district regulations. The purpose of nuisance rules is to protect the health and safety of the public by preventing the release of air contaminants that endanger the comfort, health, or safety of the public. However, nuisance rules are specifically written to exclude odors emanating from agricultural operations related to crop growing and maintenance.

California Climate and Meteorology

Because of the strong influence of the Pacific Ocean, the Coast Range, and the Sierra/Nevada Mountains, variations in climate in California run in a general east-to-west direction. California's climate varies from Mediterranean (most of the State) to steppe (scattered foothill areas), to alpine (high Sierra), to desert (Colorado and Mojave Deserts).

The Sierra Nevada and Cascade Ranges act as barriers to the passage of air masses. During summer, California is protected from much of the hot, dry air masses that develop over the central United States. Because of these barriers, and California's western border of the Pacific Ocean, summer weather in portions of the State is generally milder than that in the rest of the country and is characterized by dry, sunny conditions with infrequent rainfall.

In winter, the same mountain ranges prevent cold, dry air masses from moving into California from the central areas of the U.S. Consequently, winters in California are also milder than would be expected at these latitudes.

Regulatory Setting

Federal Regulatory Environment

The federal Clean Air Act (FCAA) was passed in 1963 by the U.S. Congress and has been amended several times, most recently in 1990. The FCAA required the EPA to establish national ambient air quality standards for air pollutants or air pollutant groups

that pose a threat to human health or welfare. EPA established the National Ambient Air Quality Standard (NAAQS) for six criteria pollutants: ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead, particulate matter and CO (see Table 10-1). Two separate standards have been set for particulate matter, one for particulate matter 10 microns or less in diameter (PM10), the other for particulate matter 2.5 microns or less in diameter (PM2.5).

Air basins that have not violated an ambient air quality standard are considered to be in attainment for that standard. Conversely, air basins with recorded violations of an ambient air quality standard are classified as nonattainment areas for that pollutant. Most air basins are classified as nonattainment areas for one or more pollutants. Also, for specific pollutants such as PM10, California has more stringent standards than those imposed by federal regulations. Consequently, an air basin may be classified as a nonattainment area for the state PM10 standard although it is in attainment for the federal PM10 standard.

Air basins classified as nonattainment areas for the NAAQS must prepare state implementation plans (SIPs) that describe the specific steps that will be taken to bring the nonattainment area into compliance. Those steps primarily include rules and regulations to limit air emissions from specific stationary and mobile sources. The FCAA contains specific dates by which the NAAQS must be met before federal sanctions can be imposed.

California Regulatory Environment

The California Clean Air Act (CCAA) of 1988 differs from the FCAA in that there are no sanctions or specific deadlines for attainment of the California Ambient Air Quality Standards (CAAQS), also shown in Table 10-1. The CAAQS were enacted in response to the need for new air quality requirements. Under this act, air quality attainment is required at the earliest practicable date and reasonable progress toward attainment must be made each year.

Similar to the FCAA, the CCAA requires attainment plans for designated nonattainment areas, which are areas that currently violate the ambient air quality standards. The California Air Resources Board (ARB) is responsible for preparing the plans for meeting the NAAQS and CAAQS and has delegated to the California air districts the responsibility for preparing air quality attainment plans. The CCAA, unlike the FCAA, does not require an air quality attainment plan for areas designated as nonattainment for the PM10 CAAQS.

Local Air Quality Regulatory Environment

The ARB has delegated much of its air pollution control authority to local air pollution control districts and air quality management districts. California's 15 air basins are identified in Figure 10-1. For some air basins covering more than one county, a unified air district has been formed to manage air quality issues throughout the basin. In other multicounty air basins, individual county air districts manage air quality in only their county.

Individual air districts or groups of air districts prepare air quality management plans designed to bring an air basin into compliance for nonattainment area pollutants. Those plans are submitted to the ARB for approval and usually contain an emissions inventory and a list of rules proposed for adoption.

Impacts and Mitigation Measures

Methods

Air quality impacts associated with treating biosolids would result from the use of biosolids hauling and application equipment, odors resulting from biosolids storage and application, wind-blown emissions of particulate matter (PM10 and PM2.5) and toxic air pollutants, and fugitive dust resulting from vehicle operations.

Vehicle exhaust and fugitive dust emissions were estimated using the California Air Resources Board's EMFAC7G vehicle emission factor model included within the URBEMIS7G model. The vehicle emissions analysis was used to determine the number of vehicle miles traveled (VMT) per day that could be generated by biosolids operations without exceeding the air emission significance thresholds (described below).

To control odor associated with biosolids operations, the GO limits the maximum amount of onsite storage to 7 days and requires that storage areas be covered between October 1 and April 30. Additionally, biosolids must be transported in covered, leakproof vehicles. Both staging and application of biosolids must comply with several buffer-zone requirements that limit storage and application to 10 feet from property lines, 50 feet from public roads, and 500 feet from residential buildings.

The GO also prohibits the release of any visible airborne particles from the application site during biosolids application or during incorporation of biosolids into the soil. This

requirement will prevent the release of PM10 and its constituents classified as hazardous air contaminants.

Thresholds of Significance

For site-specific projects, criteria established by the applicable air quality management district or air pollution control district are used to determine the significance of impacts on air quality. For this program air quality analysis, implementing the GO would result in a significant impact on air quality if it would:

- conflict with or obstruct implementation of the applicable air quality plan,
- violate any air quality standard or contribute substantially to an existing or projected air quality violation,
- result in a considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors),
- expose sensitive receptors to substantial pollutant concentrations, or
- create objectionable odors affecting a substantial number of people.

Emissions are considered significant if they exceed the most stringent significance thresholds for air districts where biosolids are applied in the greatest volumes (San Joaquin, Sacramento, South Coast, San Diego). The most stringent thresholds for those air basins are 55 pounds per day for ROG and NO_x, 550 pounds per day for CO and 150 pounds per day for PM10 (Sacramento Air Quality Management District 1994, South Coast Air Quality Management District 1993, San Joaquin Valley Unified Air Pollution Control District 1998, Reider pers. comm.).

Impacts of Agricultural Use

Impact: Generation of NO_x and PM10 from Biosolids Transport Vehicles and Biosolids Spreaders for Vehicle Travel Exceeding 4,800 VMT per day and/or 67 VMT per Day on Unpaved Roads

Transporting biosolids from wastewater treatment plants to farms and spreading and mixing biosolids into the soil would increase vehicle emissions and fugitive dust from the use of heavy-duty transport trucks and farm vehicles. As shown in Table 10-3, biosolids transport vehicle travel exceeding 4,800 VMT per day and/or 67 VMT per day on unpaved roads would exceed the significance thresholds for NO_x and PM10 for air districts where biosolids are applied in the greatest volumes (San Joaquin, Sacramento, South Coast, and San Diego). Vehicle trips that would generate less than 4,800 VMT per day or 67 VMP per day on unpaved roads would not exceed significance thresholds for the air districts where biosolids are applied in the greatest volumes.

Table 10-3.
Vehicle Emissions from Biosolids Operations (pounds/day)

	ROG	NO_x	CO	PM10
Vehicle Exhaust	7.8	55.7	82.8	2.5
Fugitive Dust	N/A	N/A	N/A	145.9
Totals	7.8	55.7	82.8	148.4

Notes: N/A = not applicable.

Emission estimates based on the California Air Resources Board's EMFAC7G model (California Air Resources Board 1999). Emissions shown are uncontrolled and assume 4,800 VMT per day of heavy-duty trucks with 98.6% of VMT on paved roads and 1.4% of VMT (67 miles) on unpaved roads.

Mitigation Measure 10-1: Properly Maintain Transport Vehicles in Good Operating Condition and Limit Truck Travel on Paved Roads to 4,800 VMT. Biosolids application projects require the use of heavy-duty trucks to haul biosolids from site generators to application sites. To keep daily NO_x emissions at or under the NO_x significance threshold, trucks must be properly maintained and kept in good operating condition. This mitigation measure will reduce NO_x emissions by 5%, thus reducing emissions to 52.9 pounds per day (assuming 4,800 VMT per day), which is below the

significance threshold. This mitigation measure will reduce NO_x emission impacts to a less-than-significant level for projects generating 4800 VMT per day or less. For projects that substantially exceed 4,800 VMT per day, no mitigation is available and, therefore, truck travel must be limited to 4,800 VMT per day.

Mitigation Measure 10-2: Control Fugitive Dust from Unpaved Roads. Delivery of biosolids often requires the use of unpaved roads that can generate substantial amounts of fugitive dust. Biosolids application projects requiring truck travel in excess of 67 VMT per day on unpaved roads would result in significant PM10 impacts. The following mitigation measures would keep daily PM10 emissions at or under the PM10 significance threshold and therefore reduce PM10 impacts to a less-than-significant level:

- Limit truck travel on unpaved roads to 67 VMT per day.

OR

- Apply water or chemical stabilizers that have no secondary ecological effects to unpaved roads in sufficient quantities to prevent visible dust emissions and limit truck travel on unpaved roads to 134 VMT per day. Water and/or chemical stabilizers can reduce dust generation by 50% from uncontrolled levels. Travel on unpaved roads in excess of 134 VMT per day, even with the use of water or chemical stabilizers, will result in emissions exceeding the PM10 significance threshold.

Impact: Exposure of Sensitive Receptors to Odors

The storage and spreading of biosolids would result in the release of odors in the immediate vicinity of the application operations. For storage and application of biosolids, the GO requires a minimum buffer zone of 500 feet from residences and 50 feet from public roads. Additionally, biosolids cannot be stored more than 7 consecutive days before application. These restrictions tend to be more stringent than buffer-zone and biosolids storage requirements at most wastewater treatment plants, which have more and varied sources of odors. Unlike wastewater treatment plants, biosolids application projects represent short-term odor sources. Because of the stringent storage and buffer-zone requirements and the short time period during which odors would be generated at application sites, odor and/or odor complaints would be minimal; therefore, this impact is considered less than significant.

Mitigation Measure: No mitigation is required.

Impact: Biosolids Drift Associated with Wind-Blown Biosolids

The potential exists for wind-blown drift of PM10 and toxic constituents during application of biosolids and when biosolids are being incorporated into the soil; however, most application sites are in low-density agricultural areas where wind-blown dust is not a major issue. Additionally, several regulatory requirements of the GO would minimize biosolids drift. These requirements include the following:

- biosolids cannot be stored in piles for more than 7 days after delivery to the site,
- a minimum buffer zone of 500 feet from residences will be maintained, and
- the release of any visible air-borne particulates from the application site during biosolids application or subsequent to spreading onto the soil will be prohibited.

The prohibition against the release of any visible air-borne particulates from the site would limit biosolids application to periods of low winds and would consequently minimize the potential for biosolids drift. This impact is therefore considered less than significant.

Impacts of Other Activities

Horticultural Use

The use of biosolids for horticultural purposes would result in air quality impacts similar to those described above under "Agricultural Use" because the same amount of emissions and fugitive dust would be generated from transporting and spreading biosolids. Therefore, Mitigation Measures 10-1 and 10-2 would be required to reduce air quality impacts resulting from land application of biosolids to a less-than-significant level. Additionally, vehicle emissions generated from transporting biosolids to large nursery operations would be similar to those described above under "Agricultural Use".

Silvicultural Use

The use of biosolids for silvicultural purposes would result in similar impacts (although the magnitude of impacts could be less if the biosolids are not incorporated into the soil) on air quality as those described above under "Agricultural Use" because the same amount of emissions and fugitive dust would be generated from transporting and spreading biosolids. Therefore, Mitigation Measures 10-1 and 10-2 would be required to

reduce air quality impacts resulting from land application of biosolids to a less-than-significant level.

Land Reclamation

The use of biosolids for land reclamation would result in similar impacts on air quality as those described above under "Agricultural Use" because the same amount of emissions and fugitive dust would occur from the transporting and spreading the biosolids. Therefore, Mitigation Measures 10-1 and 10-2 would be required to reduce air quality impacts resulting from land application of biosolids to a less-than-significant level.